Behavior of the Gastropod *Amphissa columbiana*

(Prosobranchia : Columbellidae)

BY

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Gastropods have evolved a diverse array of behavioral mechanisms for escaping from predators. Leaping, flipping, accelerated locomotion and interposition of soft body parts are all important components of gastropod escape responses (Bullock, 1953; Feder, 1963; Margolin, 1964a and b; Gonor, 1965, 1966; Kohn & Waters, 1966; and Ansell, 1969). Here I report on an unusual escape response by the snail *Amphissa columbiana* Dall, a common rocky intertidal species from the Pacific coast of North America.

I have observed the escape responses of *Amphissa columbiana* at infrequent intervals between April 1974 and June 1976. Individuals were collected at Boiler Bay, Oregon and maintained in the laboratory in a recirculating seawater system for periods of up to 5 weeks. Observations were made both in the water tables of the seawater system and in large enameled trays. Two predatory sea stars, *Pisaster ochraceus* (Brandt) and *Leptasterias hexactis* (Stimpson) were used to elicit escape responses. I examined 2 different situations. First, an actively crawling snail was confronted with a sea star. Second, a snail was held in place with forceps until a sea star attached several tube feet to the shell.

Actively crawling snails exhibit a stereotyped response to contact with a sea star. The tentacles and siphon are immediately withdrawn, the snail turns and rapidly crawls away. Frequently the shell swings through an arc of about 120° during retreat. The mean crawling rate increases significantly (Mann-Whitney U test, $p = 0.01$) after contact from 2.8 to 5.8 mm/sec.

In the second situation, where the sea star was allowed to attach to the snail, *Amphissa columbiana* exhibits a more diverse repertoire. The basic response consists of two phases. Initially the shell is violently twisted and crawling rate increases rapidly. Usually these actions are sufficient to detach the tube feet and allow the snail to retreat rapidly.

The second phase differs markedly from the first. The rapid body movements of the first phase become less violent but do not cease completely. The most obvious feature of this phase is the use of the snail's proboscis to detach the tube feet adhering to the shell. As each tube foot is touched by the proboscis tip it releases its hold on the shell and is withdrawn. When only a few tube feet remain attached the snail escapes by twisting the shell free and rapidly retreating. Whether the radula rasps the tube feet during proboscis eversion is unclear. Rasping is not necessary to cause tube foot withdrawal, because this can occur when the tube feet are gently prodded (Margolin, 1964a). Fishlyn & Phillips (1980) report a similar use of the everted proboscis by another columbellid, *Alia carinata* (Hinds), but it is unclear whether radular rasping was actually observed. However, elsewhere I have shown that the melongenids *Busycon contrarium* (Conrad) and *B. spiratum* (Lamarck) do use radular rasping in conspecific encounters and to deter predatory snails (Kent, in prep.).

Amphissa columbiana has 4 possible escape responses; 1) use twisting and running only, 2) use proboscis eversion only, 3) use twisting and running followed by proboscis eversion, and 4) use proboscis eversion followed by twisting and running. The first 3 responses are commonly observed, with individual *A. columbiana* rather stereotyped in which response they used. The fourth possible response was never observed. The reasons why this response is not used are unclear, but it may be related to the heightened aggressiveness needed to attack a predator with the proboscis.

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